

18.327/1.130: Wavelets, Filter Banks and Applications

Problem Set 1

Issued: SES #3

Due: SES #6

Matlab Exercises

Please submit your Matlab code and plots.

1. Consider a two channel perfect reconstruction filter bank (see pp. 103 in the text) with the analysis filters $h_0[n] = \{1/\sqrt{2}, 1/\sqrt{2}\}$ and $h_1[n] = \{1/\sqrt{2}, -1/\sqrt{2}\}$. Consider also a signal $x[n] = \{0, 1, -1, 2, 5, 1, 7, 0\}$.
 - (a) Find the corresponding dual(synthesis) filters $f_0[n]$ and $f_1[n]$.
 - (b) Find (and plot) the signals $v_0[n], v_1[n]$ and $x[n]$.
 - (c) Plot the zeros of the filters $h_0[n], h_1[n], f_0[n]$ and $f_1[n]$ (use `zplane`).
 - (d) Plot the frequency spectra of $v_0[n]$ and $v_1[n]$.
2. Repeat the previous problem for the filters $h_0[n] = \{-1, 2, 6, 2, -1\}/(4\sqrt{2})$ and $h_1[n] = \{1, -2, 1\}/(2\sqrt{2})$.

Textbook Problems

1. Problem Set 1.3, pp. 15. Problems 1 and 3.
2. Problem Set 1.4, pp. 21. Problems 9 and 11.
3. Problem Set 3.3, pp. 100. Problems 2 and 7.
4. Problem Set 4.1, pp. 113–114. Problems 3, 4, 9 and 12.